REMARKS/ARGUMENTS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claims 1-2, 4-8, 10-12 and 17-24 are presently active in this case, Claims 1 and 2 amended and Claim 24 added by way of the present amendment.

In the outstanding Official Action, Claim 1 was objected to for informalities; Claims 1, 5-8 and 10-12 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,589,877 to Thakur in view of Silicon Processing for the VLSI Era, vol. 1: Process Technology to Wolf et al.; Claim 2 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Thakur in view of Wolf et al., and further in view of U.S. Patent No. 6,764,967 to Pai et al.; Claims 4 and 17-20 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Thakur in view of Wolf et al., and further in view of A Study on Modified Silicon Surface After CHF_3C/C_2F_6 Reactive Ion Etching to Park et al.; and Claims 21-23 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Thakur in view of Wolf et al., and further in view of U.S. Patent Publication 2004/0121605 A1 to Maydan et al.

With regard to the objection to Claim 1, Applicants note that the Amendment filed March 28, 2006 included the proper symbol for angstroms (Å) further, Applicants note that the present amendment also includes the proper symbol for angstroms. Such symbol may have become corrupted during the scanning process at the Patent Office. The Examiner is invited to telephone the undersigned to obtain a fax copy of the Amendment if necessary. The remaining noted informalities, as well as discovered informalities, have been corrected in Claim 1 and Claim 2. Therefore, the objection to the claims is believed to be overcome.

Turning now to the merits, in order to expedite issuance of a patent in this case, Applicants have amended Claim 1 to clarify the patentable features of the present invention over the cited references.

First, Applicants have amended Claim 1 to recite thermally growing a first ultra thin oxide layer of less than 15Å in total thickness on a surface of the substrate to consume defects in a surface region of the substrate, and, without forming further oxide on the first ultra thin oxide layer, etching away the first ultra thin layer to remove at least some of said consumed defects from the substrate and reveal a subsurface of said substrate. Claim 1 has been similarly amended to clarify that the second ultra thin oxide layer and the additional ultra thin oxide layers are thermally grown, less than 15Å in thickness, and removed without forming further oxide thereon. Support for thermal oxide growth is provided by paragraph 51 of Applicants' specification as originally filed. Support for an ultra thin oxide of less than 15Å in total thickness is provided by paragraph 47 of Applicants' specification as originally filed. Support for removing the ultra thin oxide layer without further growth thereon is provided by Figures 5A-5G, and text relating thereto, of Applicants' specification as originally filed. Therefore, Applicants' amendments to Claim 1 do not raise an issue of new matter.

The cited reference to Thakur discloses a method of forming a semiconductor device, which may include use of a sacrificial oxide to remove substrate contaminants. As seen in Figure 1, the process includes a first UV ozone treatment step 22a and a subsequent oxide growth step including rapid thermal oxidation step 22d. As seen by the arrows in Figure 1, the RTO step 22d may be performed with or without the UV-ozone treatment step 22a. Although Thakur discloses that the RTO step can grow an oxide thickness of at least 10Å, Thakur states,

> In addition to this initial step of growing an oxide, there are additional steps which may take place to enhance the oxide formation stage 22. For instance, after the vapor clean 20b has been performed, yet before the RTO process 22d begins, it may be beneficial to induce chemical oxide growth on the wafer through an ultraviolet ozone treatment 22a, wherein ultraviolet radiation is used to enhance the oxidation rate of the silicon substrate in an ozone environment. This treatment 22a is preferably carried out long enough to provide a high quality oxide layer having a thickness generally ranging from 10-15Å. Regardless of whether the oxide is provided in one

> step or a plurality of steps it is preferably to have approximately 30-40Å of oxide once step 22d has been completed. [1]

Thus, Thakur makes clear that a thickness of the oxide after the RTO step 22d is 30-40Å, whether the oxide is performed by step 22d alone or a combination of steps 22a and 22d. That is, a step 22d RTO oxide growth of 10Å may be used in combination with step 22a growth to obtain a total thickness of 30 to 40Å. Column 5 indicates that this total oxide thickness may be removed as a sacrificial oxide. However, there is no indication in Thakur that the oxide thickness to be removed is less than 15Å as now clearly recited in Claim 1.

The Official Action acknowledges that Thakur does not disclose growing an oxide layer between 5 and 15Å, but apparently concludes that the 10Å RTO step of Thakur is a "less preferred embodiment" that falls within the 5-15Å range. However, there is no disclosure (preferred or less preferred) in Thakur that an oxide thickness having a total thickness of less than 15Å is grown and removed from the substrate as now required by Claim 1. While Thakur discloses an RTO step that can grow 10Å of oxide, this step is used in combination with other steps to provide a total oxide thickness of 30-40Å as discussed above. Therefore, the 10Å disclosure does not fall within the claimed range as required by M.P.E.P. § 2144.05, cited by the Examiner.

For the reasons discussed above, Thakur does not disclose growing a first ultra thin oxide layer of less than 15Å in total thickness... and without forming further oxide on the first ultra thin oxide layer, etching away the first ultra thin oxide layer. The cited reference to Wolf et al. is a silicon processing textbook which discloses only general aspects of silicon processing technology. Therefore, Wolf et al. does not correct the deficiencies of Thakur. Thus, Applicants' Claim 1, as amended, patentably defines over the cited references.

In addition, Applicants' Claim 1 requires monitoring the surface region of the substrate for additional defects, and repeatedly growing and etching an additional ultra thin

[1] Thakur, at col. 4, lines 37-50.

oxide layer to consume the additional defects to provide a substantially contaminant free substrate surface. The Office Action acknowledges that the combination of Thakur and Wolf et al. does not disclose this limitation but concludes that the limitation is inherent. However, it is settled law that "to establish inherency, the intrinsic evidence 'must make clear' that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill."[2] Moreover, "inherency may not be established by probabilities or possibilities. The mere fact that certain thing may result from a given set of circumstances is not sufficient."[3] The Office Action makes no effort to explain why it is believed that it is necessary to detect a level of contaminants on the substrate in order to continue or stop growing an etching step until the substrate is substantially free of contaminants. Applicants submit that such monitoring is not necessary. For example, the oxide growth and etch process could be stopped after an arbitrary number of cycles based on historical data. This requires no monitoring of the substrate surface at all. Thus, Applicants' monitoring step provides an additional basis for patentability of Claim 1 over the cited references.

As Applicants Claim 1 patentably defines over the cited references as discussed above, the remaining dependent claims also patentably define over the cited references. Applicants further note, however, that dependent Claims 2 and 17-20 relate to monitoring a surface of the substrate for defects. Thus these claims provide an additional basis for patentability over the cited references.

Finally, new Claim 24 recites the same limitations as Claim 1, except that the oxide layer grown and removed is approximately 5-10 Å. Thus, Applicants' Claim 24 recited narrower range than Claim 1 and is patentable over the cited references for the reasons discussed above.

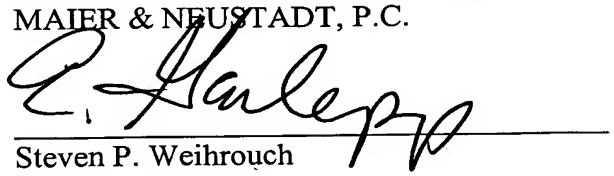
---

[2] In re Robertson, 49 USPQ2d 1949, 1951 (Fed. Cir. 1999).
[3] Continental Can Company v. Monsanto Co., 948 F.2d 1264, 1269, 20 USPQ2d 1746 (Fed. Cir. 1991).

Consequently, in view of the present amendment, no further issues are believed to be outstanding in the present application and the present application is believed to be in condition for formal allowance. An early and favorable action is therefore respectfully requested.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.



Customer Number
22850

Tel: (703) 413-3000
Fax: (703) 413 -2220
(OSMMN 06/04)

Steven P. Weihrouch
Attorney of Record
Registration No. 32,829
Edwin D. Garlepp
Registration No. 45,330

I:\ATTY\EDG\240579US-AM3.DOC